PATENT COOPERATION TREATY

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference	**FOR FURTHER ACTION** see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, item 5 below.	
P0004/PCT		
International application No.	International filing date *(day/month/year)*	(Earliest) Priority Date *(day/month/year)*
PCT/EP 99/09173	23/11/1999	28/11/1998
Applicant		
QUAY TECHNOLOGIES LTD et al.		

This International Search Report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This International Search Report consists of a total of 5 sheets.

[X] It is also accompanied by a copy of each prior art document cited in this report.

1. **Basis of the report**

a. With regard to the **language**, the international search was carried out on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.

[ ] the international search was carried out on the basis of a translation of the international application furnished to this Authority (Rule 23.1(b)).

b. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international search was carried out on the basis of the sequence listing :

[ ] contained in the international application in written form.

[ ] filed together with the international application in computer readable form.

[ ] furnished subsequently to this Authority in written form.

[ ] furnished subsequently to this Authority in computer readble form.

[ ] the statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.

[ ] the statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished

2. [X] **Certain claims were found unsearchable** (See Box I).

3. [ ] **Unity of invention is lacking** (see Box II).

4. With regard to the **title,**

[X] the text is approved as submitted by the applicant.

[ ] the text has been established by this Authority to read as follows:

5. With regard to the **abstract,**

[X] the text is approved as submitted by the applicant.

[ ] the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. The figure of the **drawings** to be published with the abstract is Figure No. _____

[ ] as suggested by the applicant.

[ ] because the applicant failed to suggest a figure.

[ ] because this figure better characterizes the invention.

[X] None of the figures.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/EP 99/09173

Box I Obs rvations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for th following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☒ Claims Nos.: 20,23,26
because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:
In view of the large number of compounds which are defined by the wording of the claims, the search has been performed on the general idea and compounds mentioned in the examples of the description.

3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

1. ☐ As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.

2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.

3. ☐ As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

☐ Th additional search fees were accompanied by the applicant's protest.

☐ No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

Continuation of Box I.2

Claims Nos.: 20,23,26

In view of the wording of claims 20, 23, 26 presently on file, which render it difficult, if not impossible, to determine the matter for which protection is sought, the present application fails to comply with the requirements of Article 6 PCT (see also Rule 6.3(a) PCT and 6.2 (a)) to such an extent that a meaningful search is impossible.
Consequently search have been carried out on claims 1-19,21,22,24,25

The applicant's attention is drawn to the fact that claims, or parts of claims, relating to inventions in respect of which no international search report has been established need not be the subject of an international preliminary examination (Rule 66.1(e) PCT). The applicant is advised that the EPO policy when acting as an International Preliminary Examining Authority is normally not to carry out a preliminary examination on matter which has not been searched. This is the case irrespective of whether or not the claims are amended following receipt of the search report or during any Chapter II procedure.

INTERNATIONAL SEARCH REPORT

International Application No
PCT/EP 99/09173

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 A61L9/20 C02F1/32 H01J65/04

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 A61L B01J H01J C02F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 3 911 318 A (URV MICHAEL G ET AL) 7 October 1975 (1975-10-07) column 4, line 17 - line 32 column 8, line 29 - line 39 column 9, line 24 - line 43 column 10, line 7 - line 20 ---	1-19,21, 22,24,25
X	PATENT ABSTRACTS OF JAPAN vol. 010, no. 203 (C-360), 16 July 1986 (1986-07-16) & JP 61 046290 A (TOSHIBA CORP), 6 March 1986 (1986-03-06) abstract --- -/--	1-3,5,6, 9,12-18, 21,22, 24,25

[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

° Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
27 April 2000	10/05/2000

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Muñoz, M

Form PCT/ISA/210 (second sheet) (July 1992)

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication,where appropriate, of the relevant passages	Relevant to claim No.
X	WO 96 09842 A (BODY SHOP INT PLC ;BAILEY WILLIAM (GB); LITTLE RICHARD (GB)) 4 April 1996 (1996-04-04) page 3, paragraph 2 - paragraph 3 page 6, paragraph 3	1-3,5,6, 9,12-16, 21,22,24

1

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No
PCT/EP 99/09173

Patent document cited in search report		Publication date	Patent family member(s)		Publication date
US 3911318	A	07-10-1975	NONE		
JP 61046290	A	06-03-1986	NONE		
WO 9609842	A	04-04-1996	AT	177649 T	15-04-1999
			AU	700759 B	14-01-1999
			AU	3530195 A	19-04-1996
			CA	2200988 A	04-04-1996
			DE	69508413 D	22-04-1999
			EP	0783327 A	16-07-1997
			JP	10502563 T	10-03-1998
			NO	971456 A	20-05-1997
			US	6028315 A	22-02-2000

ATENT COOPERATION TREATY

PIKE & Co.
RECEIVED 12 MAY 2000 INIT
PCT ACTION DATE ATTN FILE

From the INTERNATIONAL SEARCHING AUTHORITY

To:
PIKE & CO.
Attn. PIKE, Christopher G
Hayes Loft
68A Hayes Place
Marlow, Buckinghamshire SL7 2BT
UNITED KINGDOM

NOTIFICATION OF TRANSMITTAL OF THE INTERNATIONAL SEARCH REPORT OR THE DECLARATION

(PCT Rule 44.1)

Applicant's or agent's file reference P0004/PCT	Date of mailing *(day/month/year)* 10/05/2000 **FOR FURTHER ACTION** See paragraphs 1 and 4 below
International application No. PCT/EP 99/09173	International filing date *(day/month/year)* 23/11/1999
Applicant QUAY TECHNOLOGIES LTD et al.	

1. [X] The applicant is hereby notified that the International Search Report has been established and is transmitted herewith.

Filing of amendments and statement under Article 19:
The applicant is entitled, if he so wishes, to amend the claims of the International Application (see Rule 46):

When? The time limit for filing such amendments is normally 2 months from the date of transmittal of the International Search Report; however, for more details, see the notes on the accompanying sheet.

Where? Directly to the International Bureau of WIPO
34, chemin des Colombettes
1211 Geneva 20, Switzerland
Fascimile No.: (41-22) 740.14.35

For more detailed instructions, see the notes on the accompanying sheet.

2. [ ] The applicant is hereby notified that no International Search Report will be established and that the declaration under Article 17(2)(a) to that effect is transmitted herewith.

3. [ ] **With regard to the protest** against payment of (an) additional fee(s) under Rule 40.2, the applicant is notified that:

[ ] the protest together with the decision thereon has been transmitted to the International Bureau together with the applicant's request to forward the texts of both the protest and the decision thereon to the designated Offices.

[ ] no decision has been made yet on the protest; the applicant will be notified as soon as a decision is made.

4. **Further action(s):** The applicant is reminded of the following:

Shortly after **18 months** from the priority date, the international application will be published by the International Bureau. If the applicant wishes to avoid or postpone publication, a notice of withdrawal of the international application, or of the priority claim, must reach the International Bureau as provided in Rules 90*bis*.1 and 90*bis*.3, respectively, before the completion of the technical preparations for international publication.

Within **19 months** from the priority date, a demand for international preliminary examination must be filed if the applicant wishes to postpone the entry into the national phase until 30 months from the priority date (in some Offices even later).

Within **20 months** from the priority date, the applicant must perform th prescribed acts for entry into the national phase before all designated Offices which have not been elected in th demand or in a later election within 19 months from th priority date or could not be elected because they are not bound by Chapter II.

Nam and mailing address of th International Searching Authority European Patent Office, P.B. 5818 Patentlaan 2 NL-2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Authorized officer Maurizio Amodeo

Form PCT/ISA/220 (July 1998)

NOTES TO FORM PCT/ISA/220

These Notes are intended to give the basic instructions concerning the filing of amendments under article 19. The Notes are based on the requirements of the Patent Cooperation Treaty, the Regulations and the Administrative Instructions under that Treaty. In case of discrepancy between these Notes and those requirements, the latter are applicable. For more detailed information, see also the PCT Applicant's Guide, a publication of WIPO.

In these Notes, "Article", "Rule", and "Section" refer to the provisions of the PCT, the PCT Regulations and the PCT Administrative Instructions respectively.

INSTRUCTIONS CONCERNING AMENDMENTS UNDER ARTICLE 19

The applicant has, after having received the international search report, one opportunity to amend the claims of the international application. It should however be emphasized that, since all parts of the international application (claims, description and drawings) may be amended during the international preliminary examination procedure, there is usually no need to file amendments of the claims under Article 19 except where, e.g. the applicant wants the latter to be published for the purposes of provisional protection or has another reason for amending the claims before international pbulication. Furthermore, it should be emphasized that provisional protection is available in some States only.

What parts of the international application may be amended?

Under Article 19, only the claims may be amended.

During the international phase, the claims may also be amended (or further amended) under Article 34 before the International Preliminary Examining Authority. The description and drawings may only be amended under Article 34 before the International Examining Authority.

Upon entry into the national phase, all parts of the international application may be amended under Article 28 or, where applicable, Article 41.

When?

Within 2 months from the date of transmittal of the international search report or 16 months from the priority date, whichever time limit expires later. It should be noted, however, that the amendments will be considered as having been received on time if they are received by the International Bureau after the expiration of the applicable time limit but before the completion of the technical preparations for international publication (Rule 46.1).

Where not to file the amendments?

The amendments may only be filed with the International Bureau and not with the receiving Office or the International Searching Authority (Rule 46.2).

Where a demand for international preliminary examination has been/is filed, see below.

How?

Either by cancelling one or more entire claims, by adding one or more new claims or by amending the text of one or more of the claims as filed.

A replacement sheet must be submitted for each sheet of the claims which, on account of an amendment or amendments, differs from the sheet originally filed.

All the claims appearing on a replacement sheet must be numbered in Arabic numerals. Where a claim is cancelled, no renumbering of the other claims is required. In all cases where claims are renumbered, they must be renumbered consecutively (Administrative Instructions, Section 205(b)).

The amendments must be made in the language in which the international application is to be published.

What documents must/may accompany the amendments?

Letter (Section 205(b)):

The amendments must be submitted with a letter.

The letter will not be published with the international application and the amended claims. It should not be confused with the "Statement under Article 19(1)" (see below, under "Statement under Article 19(1)").

The letter must be in English or French, at the choice of the applicant. However, if the language of the international application is English, the letter must be in English; if the language of the international application is French, the letter must be in French.

The letter must indicate the differences between the claims as filed and the claims as amended. It must, in particular, indicate, in connection with each claim appearing in the international application (it being understood that identical indications concerning several claims may be grouped),whether

(i) the claim is unchanged;

(ii) the claim is cancelled;

(iii) the claim is new;

(iv) the claim replaces one or more claims as filed;

(v) the claim is the result of the division of a claim as filed.

The following examples illustrate the manner in which amendments must be explained in the accompanying letter:

1. [Where originally there were 48 claims and after amendment of some claims there are 51]:
"Claims 1 to 29, 31, 32, 34, 35, 37 to 48 replaced by amended claims bearing the same numbers; claims 30, 33 and 36 unchanged; new claims 49 to 51 added."

2. [Where originally there were 15 claims and after amendment of all claims there are 11]:
"Claims 1 to 15 replaced by amended claims 1 to 11."

3. [Where originally there were 14 claims and the amendments consist in cancelling some claims and in adding new claims]:
"Claims 1 to 6 and 14 unchanged; claims 7 to 13 cancelled; new claims 15, 16 and 17 added." or
"Claims 7 to 13 cancelled; new claims 15, 16 and 17 added; all other claims unchanged."

4. [Where various kinds of amendments are made]:
"Claims 1-10 unchanged; claims 11 to 13, 18 and 19 cancelled; claims 14, 15 and 16 replaced by amended claim 14; claim 17 subdivided into amended claims 15, 16 and 17; new claims 20 and 21 added."

"Statement under article 19(1)" (Rule 46.4)

The amendments may be accompanied by a statement explaining the amendments and indicating any impact that such amendments might have on the description and the drawings (which cannot be amended under Article 19(1)).

The statement will be published with the international application and the amended claims.

It must be in the language in which the international appplication is to be published.

It must be brief, not exceeding 500 words if in English or if translated into English.

It should not be confused with and does not replace the letter indicating the differences between the claims as filed and as amended. It must be filed on a separate sheet and must be identified as such by a heading, preferably by using the words "Statement under Article 19(1)."

It may not contain any disparaging comments on the international search report or the relevance of citations contained in that report. Reference to citations, relevant to a given claim, contained in the international search report may be made only in connection with an amendment of that claim.

Consequence if a demand for international preliminary examination has already been filed

If, at the time of filing any amendments under Article 19, a demand for international preliminary examination has already been submitted, the applicant must preferably, at the same time of filing the amendments with the International Bureau, also file a copy of such amendments with the International Preliminary Examining Authority (see Rule 62.2(a), first sentence).

Consequence with regard to translation of the international application for entry into the national phase

The applicant's attention is drawn to the fact that, where upon entry into the national phase, a translation of the claims as amended under Article 19 may have to be furnished to the designated/elected Offices, instead of, or in addition to, the translation of the claims as filed.

For further details on the requirements of each designated/elected Office, see Volume II of the PCT Applicant's Guide.

[redacted]TENT COOPERATION TRE[redacted]

From the INTERNATIONAL BUREAU

PCT

NOTICE INFORMING THE APPLICANT OF THE COMMUNICATION OF THE INTERNATIONAL APPLICATION TO THE DESIGNATED OFFICES

(PCT Rule 47.1(c), first sentence)

To:
PIKE, Christopher, Gerard
Pike & Co.
Hayes Loft
68A Hayes Place
Marlow
Buckinghamshire SL7 2BT
ROYAUME-UNI

Date of mailing (day/month/year) 08 June 2000 (08.06.00)		
Applicant's or agent's file reference P0004/PCT	**IMPORTANT NOTICE**	
International application No. PCT/EP99/09173	**International filing date** (day/month/year) 23 November 1999 (23.11.99)	**Priority date** (day/month/year) 28 November 1998 (28.11.98)
Applicant QUAY TECHNOLOGIES LTD et al		

1. Notice is hereby given that the International Bureau has communicated, as provided in Article 20, the international application to the following designated Offices on the date indicated above as the date of mailing of this Notice:
   AU,CN,JP,KP,KR,MA,US

   In accordance with Rule 47.1(c), third sentence, those Offices will accept the present Notice as conclusive evidence that the communication of the international application has duly taken place on the date of mailing indicated above and no copy of the international application is required to be furnished by the applicant to the designated Office(s).

2. The following designated Offices have waived the requirement for such a communication at this time:
   AE,AL,AM,AP,AT,AZ,BA,BB,BG,BR,BY,CA,CH,CR,CU,CZ,DE,DK,DM,EA,EE,EP,ES,FI,GB,GD,GE,
   GH,GM,HR,HU,ID,IL,IN,IS,KE,KG,KZ,LC,LK,LR,LS,LT,LU,LV,MD,MG,MK,MN,MW,MX,NO,NZ,OA,
   PL,PT,RO,RU,SD,SE,SG,SI,SK,SL,TJ,TM,TR,TT,TZ,UA,UG,UZ,VN,YU,ZA,ZW
   The communication will be made to those Offices only upon their request. Furthermore, those Offices do not require the applicant to furnish a copy of the international application (Rule 49.1(a-bis)).

3. Enclosed with this Notice is a copy of the international application as published by the International Bureau on
   08 June 2000 (08.06.00) under No. WO 00/32244

REMINDER REGARDING CHAPTER II (Article 31(2)(a) and Rule 54.2)

If the applicant wishes to postpone entry into the national phase until 30 months (or later in some Offices) from the priority date, **a demand for international preliminary examination** must be filed with the competent International Preliminary Examining Authority before the expiration of 19 months from the priority date.

It is the applicant's sole responsibility to monitor the 19-month time limit.

Note that only an applicant who is a national or resident of a PCT Contracting State which is bound by Chapter II has the right to file a demand for international preliminary examination.

REMINDER REGARDING ENTRY INTO THE NATIONAL PHASE (Article 22 or 39(1))

If the applicant wishes to proceed with the international application in the **national phase**, he must, within 20 months or 30 months, or later in some Offices, perform the acts referred to therein before each designated or elected Office.

For further important information on the time limits and acts to be performed for entering the national phase, see the Annex to Form PCT/IB/301 (Notification of Receipt of Record Copy) and Volume II of the PCT Applicant's Guide.

Th Internati nal Bureau of WIPO
34, chemin des Colombettes
1211 Geneva 20, Switz rland

Facsimile No. (41-22) 740.14.35

Authorized officer
J. Zahra

Telephone No. (41-22) 338.83.38

Continuation of Form PCT/IB/30[redacted]

NOTICE INFORMING THE APPLICANT OF THE COMMUNICATION OF THE INTERNATIONAL APPLICATION TO THE DESIGNATED OFFICES

Date of mailing (day/month/year) 08 June 2000 (08.06.00)	IMPORTANT NOTICE
Applicant's or agent's file reference P0004/PCT	**International application No.** PCT/EP99/09173

The applicant is hereby notified that, at the time of establishment of this Notice, the time limit under Rule 46.1 for making amendments under Article 19 has not yet expired and the International Bureau had received neither such amendments nor a declaration that the applicant does not wish to make amendments.

PATENT COOPERATION TREA. /

PCT

NOTIFICATION OF ELECTION

(PCT Rule 61.2)

From the INTERNATIONAL BUREAU

To:

Assistant Commissioner for Patents
United States Patent and Trademark Office
Box PCT
Washington, D.C.20231
ETATS-UNIS D'AMERIQUE

in its capacity as elected Office

Date of mailing (day/month/year) 19 July 2000 (19.07.00)	
International application No. PCT/EP99/09173	**Applicant's or agent's file reference** P0004/PCT
International filing date (day/month/year) 23 November 1999 (23.11.99)	**Priority date** (day/month/year) 28 November 1998 (28.11.98)
Applicant LUCAS, James et al	

1. The designated Office is hereby notified of its election made:

[X] in the demand filed with the International Preliminary Examining Authority on:

08 June 2000 (08.06.00)

[ ] in a notice effecting later election filed with the International Bureau on:

2. The election [X] was

[ ] was not

made before the expiration of 19 months from the priority date or, where Rule 32 applies, within the time limit under Rule 32.2(b).

The International Bureau of WIPO **34, chemin des Colombettes** **1211 Geneva 20, Switzerland**	Authorized officer Olivia RANAIVOJAONA
Facsimile No.: (41-22) 740.14.35	Telephone No.: (41-22) 338.83.38

Form PCT/IB/331 (July 1992)

EP9909173

PATENT COOPERATION TREATY

From the
INTERNATIONAL PRELIMINARY EXAMINING AUTHORITY

To:

PIKE, Christopher G
PIKE & CO.
Hayes Loft
68A Hayes Place
Marlow, Buckinghamshire SL7 2BT
GRANDE BRETAGNE

NOTIFICATION OF TRANSMITTAL OF
THE INTERNATIONAL PRELIMINARY
EXAMINATION REPORT
(PCT Rule 71.1)

Date of mailing *(day/month/year)*	08. 01. 01
Applicant's or agent's file reference P0004/PCT	**IMPORTANT NOTIFICATION**

International application No.	International filing date *(day/month/year)*	Priority date *(day/month/year)*
PCT/EP99/09173	23/11/1999	28/11/1998

Applicant
QUAY TECHNOLOGIES LTD et al.

1. The applicant is hereby notified that this International Preliminary Examining Authority transmits herewith the international preliminary examination report and its annexes, if any, established on the international application.

2. A copy of the report and its annexes, if any, is being transmitted to the International Bureau for communication to all the elected Offices.

3. Where required by any of the elected Offices, the International Bureau will prepare an English translation of the report (but not of any annexes) and will transmit such translation to those Offices.

4. **REMINDER**

The applicant must enter the national phase before each elected Office by performing certain acts (filing translations and paying national fees) within 30 months from the priority date (or later in some Offices) (Article 39(1)) (see also the reminder sent by the International Bureau with Form PCT/IB/301).

Where a translation of the international application must be furnished to an elected Office, that translation must contain a translation of any annexes to the international preliminary examination report. It is the applicant's responsibility to prepare and furnish such translation directly to each elected Office concerned.

For further details on the applicable time limits and requirements of the elected Offices, see Volume II of the PCT Applicant's Guide.

Name and mailing address of the IPEA/	Authorized officer
European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Fuerbass, C Tel.+49 89 2399-8132

PATENT COOPERATION TREATY

PCT

REC'D 11 JAN 2001

WIPO PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference	FOR FURTHER ACTION	See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)
P0004/PCT		
International application No.	International filing date *(day/month/year)*	Priority date *(day/month/year)*
PCT/EP99/09173	23/11/1999	28/11/1998
International Patent Classification (IPC) or national classification and IPC A61L9/20		
Applicant QUAY TECHNOLOGIES LTD et al.		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 5 sheets, including this cover sheet.

   ☒ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

   These annexes consist of a total of 3 sheets.

3. This report contains indications relating to the following items:

   - I ☒ Basis of the report
   - II ☐ Priority
   - III ☒ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
   - IV ☐ Lack of unity of invention
   - V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations suporting such statement
   - VI ☐ Certain documents cited
   - VII ☐ Certain defects in the international application
   - VIII ☐ Certain observations on the international application

Date of submission of the demand	Date of completion of this report
08/06/2000	08.01.01
Name and mailing address of the international preliminary examining authority: European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized officer Tiercet, M Telephone No. +49 89 2399 8977

Form PCT/IPEA/409 (cover sheet) (January 1994)

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/EP99/09173

I. Basis of the report

1. This report has been drawn on the basis of *(substitute sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to the report since they do not contain amendments (Rules 70.16 and 70.17).)*:
Description, pages:

1-6	as originally filed	

Claims, No.:

14-28	with telefax of	30/10/2000
1-13,29-36	with telefax of	18/12/2000

Drawings, sheets:

1/4-4/4	as originally filed

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

   These elements were available or furnished to this Authority in the following language: , which is:

   - ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
   - ☐ the language of publication of the international application (under Rule 48.3(b)).
   - ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

   - ☐ contained in the international application in written form.
   - ☐ filed together with the international application in computer readable form.
   - ☐ furnished subsequently to this Authority in written form.
   - ☐ furnished subsequently to this Authority in computer readable form.
   - ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
   - ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
- ☐ the claims, Nos.:
- ☐ the drawings, sheets:

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

   (Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)

6. Additional observations, if necessary:

III. Non-establishment of opinion with regard to novelty, inventive step and industrial applicability

1. The questions whether the claimed invention appears to be novel, to involve an inventive step (to be non-obvious), or to be industrially applicable have not been examined in respect of:

   ☐ the entire international application.

   ☒ claims Nos. 23, 33, 36.

because:

- ☐ the said international application, or the said claims Nos. relate to the following subject matter which does not require an international preliminary examination (*specify*):

- ☐ the description, claims or drawings (*indicate particular elements below*) or said claims Nos. are so unclear that no meaningful opinion could be formed (*specify*):

- ☐ the claims, or said claims Nos. are so inadequately supported by the description that no meaningful opinion could be formed.

- ☒ no international search report has been established for the said claims Nos. 23, 33, 36.

2. A meaningful international preliminary examination report cannot be carried out due to the failure of the nucleotide and/or amino acid sequence listing to comply with the standard provided for in Annex C of the Administrative Instructions:

   ☐ the written form has not been furnished or does not comply with the standard.

   ☐ the computer readable form has not been furnished or does not comply with the standard.

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	1-22, 24-32, 34-35
	No:	Claims	
Inventive step (IS)	Yes:	Claims	1-22, 24-32, 34-35
	No:	Claims	
Industrial applicability (IA)	Yes:	Claims	1-22, 24-32, 34-35
	No:	Claims	

2. Citations and explanations
see separate sheet

Ad III:

Claims 23, 33, 36 contain a reference to the description and the drawings. According to Rule 6.2(a) PCT, claims should not contain such references except where absolutely necessary, which is not the case here.

Ad V:

Compared to the nearest prior art, the document WO-A-9609842 which describes a chamber sterilisation apparatus, comprising a microwave source, an ultraviolet light source which is surrounded by a hollow column to protect the bulb, the independant claims 1, 31 and 34 prescribe as main novel feature that a UV-transparent waveguide, which guides the energy from a microwave source wholly surrounds the ultraviolet lamp. This novel feature combines safe guidance of the energy and protection of the ultraviolet lamp. None of the documents cited in the search report could suggest this specific features. The document PATENT ABSTRACTS OF JAPAN, vol. 010, no. 203(C-360) describes a device having a UV-lamp, which surrounds a rod shaped antenna connected by a coaxial cable to a waveguide; the US-A-3911318 describes an apparatus comprising a waveguide only partially surrounding the UV-lamp. Independant claims 1, 31 and 34 are thus considered to define non-obvious alternatives and meet the requirements of Article 33(2) and 33(3). The same argumentation is valid for independant claims 24, 26 to 30, referring back to claim 1. The industrial applicability is evident.

PATENT
3552-0107P

IN THE U.S. PATENT AND TRADEMARK OFFICE

Applicant: LUCAS, James et al.

Appl. No.: NEW

Filed: May 10, 2001

For: STERILISER

LETTER

Assistant Commissioner for Patents
Washington, DC 20231

May 10, 2001

Sir:

The PTO is requested to use the amended sheets/claims attached hereto (which correspond to Article 19 amendments or to claims attached to the International Preliminary Examination Report) during prosecution of the above-identified national phase PCT application.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment or credit any overpayment to Deposit Account No. 02-2448 for any additional fees required under 37 C.F.R. § 1.16 or under 37 C.F.R. § 1.17; particularly, extension of time fees.

Respectfully submitted,

BIRCH, STEWART, KOLASCH & BIRCH, LLP

By _____
Joe McKinney Muncy, #32,334

P.O. Box 747
Falls Church, VA 22040-0747
(703) 205-8000

KM/asc
3552-0107P

Attachments

(Rev. 01/22/01)

P0004 – Art 19 amended claims NEW

Claims

1. An ultraviolet light source comprising

an ultraviolet lamp;

a microwave energy source for exciting said ultraviolet lamp; and

a waveguide for guiding microwave energy originating from said microwave energy source to the ultraviolet lamp, wherein said waveguide is UV transparent and wholly surrounds the ultraviolet lamp.

2. An ultraviolet light source according to claim 1, wherein the ultraviolet lamp has no electrode.

3. An ultraviolet light source according to claim 2, comprising an element or mixture of elements in vapour form.

4. An ultraviolet light source according to claim 3, wherein said element or mixture of elements comprises mercury, sodium, sulphur or mixtures of inert gases with mercury compounds.

5. An ultraviolet light source according to any of claims 2 to 4 having a dominant wavelength of 254nm.

6. An ultraviolet light source according to any of claims 1 to 5, wherein the waveguide controls the flow of microwave energy from the enclosure.

7. An ultraviolet light source according to either of claims 1 to 5, wherein the waveguide blocks the flow of microwave energy from the enclosure.

8. An ultraviolet light source according to any of claims 1 to 7, wherein the enclosure comprises quartz or a UV-transparent plastic material.

9. An ultraviolet light source according to any of claims 1 to 8, wherein the waveguide comprises a conducting material.

10. An ultraviolet light source according to claim 9, wherein the waveguide comprises a conducting mesh.

11. An ultraviolet light source according to claim 10, wherein the conducting mesh comprises a material selected from the group consisting of copper, aluminium and stainless steel.

12. An ultraviolet light source according to any of claims 1 to 11, wherein the ultraviolet lamp has an elongate form.

13. An ultraviolet light source according to any of claims 1 to 12, wherein the transparent waveguide has a cylindrical or rectangular form.

P0004 – Art 19 amended claims

14. An ultraviolet light source according to any of claims 1 to 13, wherein the ultraviolet lamp has an operating temperature of less than 70°C.

15. An ultraviolet light source according to any of claims 1 to 14, wherein the microwave energy source comprises a magnetron.

16. An ultraviolet light source according to any of claims 1 to 15, additionally comprising a pathguide to guide the microwave energy from the microwave energy source to the ultraviolet lamp.

17. An ultraviolet light source according to claim 16, wherein the pathguide defines an essentially linear path.

18. An ultraviolet light source according to claim 16, wherein the pathguide defines a non-linear path.

19. An ultraviolet light source according to any of claims 1 to 18 additionally comprising a housing for said enclosure.

20. An ultraviolet light source according to claim 19, wherein the housing has an inlet and an outlet and the housing is shaped to guide fluid flow from the inlet, past the enclosure to the outlet.

21. An ultraviolet light source according to claim 20, wherein said fluid comprises water or air.

22. An ultraviolet light source according to either of claims 20 or 21, additionally comprising a pump for pumping fluid from the inlet, past the enclosure to the outlet.

23. An ultraviolet light source substantially as described in the accompanying description and drawings

24. Use of an ultraviolet light source according to any of claims 1 to 23 for sterilising a substance.

25. Use according to claim 24, wherein said substance is selected from the group consisting of water for human consumption; waste water; sewage; metallic and non-metallic objects; and air.

26. Use of an ultraviolet light source according to any of claims 1 to 23 for curing glues and inks.

27. Use of an ultraviolet light source according to any of claims 1 to 23 for erasing eproms.

28. Use of an ultraviolet light source according to any of claims 1 to 23 for killing bacteria on the surface of goods.

P0004 – Art 19 amended claims NEW

29. Air conditioning system comprising an ultraviolet light source according to any of claims 1 to 23.

30. High intensity lighting system comprising an ultraviolet light source according to any of claims 1 to 23.

31. A lamp arrangement comprising

an ultraviolet lamp, said lamp being excitable by microwave energy; and

a waveguide for guiding microwave energy originating from a microwave energy source to the ultraviolet lamp,

wherein said waveguide is UV transparent and wholly surrounds the ultraviolet lamp.

32. A lamp arrangement according to claim 31, wherein the ultraviolet lamp has no electrode.

33. A lamp arrangement substantially as described in the accompanying description and drawings

34. A method of sterilising a substance comprising

guiding microwave energy from a microwave energy source to an ultraviolet lamp to produce ultraviolet radiation; and

exposing the substance to said ultraviolet radiation, wherein

a waveguide guides said microwave energy to said ultraviolet lamp and said waveguide is UV transparent and wholly surrounds the ultraviolet lamp.

35. A method according to claim 34, wherein the substance flows past said enclosure.

36. A method of sterilising a substance substantially as described in the accompanying description and drawings.

FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AL	Albania	**ES**	Spain	**LS**	Lesotho	**SI**	Slovenia
AM	Armenia	**FI**	Finland	**LT**	Lithuania	**SK**	Slovakia
AT	Austria	**FR**	France	**LU**	Luxembourg	**SN**	Senegal
AU	Australia	**GA**	Gabon	**LV**	Latvia	**SZ**	Swaziland
AZ	Azerbaijan	**GB**	United Kingdom	**MC**	Monaco	**TD**	Chad
BA	Bosnia and Herzegovina	**GE**	Georgia	**MD**	Republic of Moldova	**TG**	Togo
BB	Barbados	**GH**	Ghana	**MG**	Madagascar	**TJ**	Tajikistan
BE	Belgium	**GN**	Guinea	**MK**	The former Yugoslav Republic of Macedonia	**TM**	Turkmenistan
BF	Burkina Faso	**GR**	Greece			**TR**	Turkey
BG	Bulgaria	**HU**	Hungary	**ML**	Mali	**TT**	Trinidad and Tobago
BJ	Benin	**IE**	Ireland	**MN**	Mongolia	**UA**	Ukraine
BR	Brazil	**IL**	Israel	**MR**	Mauritania	**UG**	Uganda
BY	Belarus	**IS**	Iceland	**MW**	Malawi	**US**	United States of America
CA	Canada	**IT**	Italy	**MX**	Mexico	**UZ**	Uzbekistan
CF	Central African Republic	**JP**	Japan	**NE**	Niger	**VN**	Viet Nam
CG	Congo	**KE**	Kenya	**NL**	Netherlands	**YU**	Yugoslavia
CH	Switzerland	**KG**	Kyrgyzstan	**NO**	Norway	**ZW**	Zimbabwe
CI	Côte d'Ivoire	**KP**	Democratic People's Republic of Korea	**NZ**	New Zealand		
CM	Cameroon			**PL**	Poland		
CN	China	**KR**	Republic of Korea	**PT**	Portugal		
CU	Cuba	**KZ**	Kazakstan	**RO**	Romania		
CZ	Czech Republic	**LC**	Saint Lucia	**RU**	Russian Federation		
DE	Germany	**LI**	Liechtenstein	**SD**	Sudan		
DK	Denmark	**LK**	Sri Lanka	**SE**	Sweden		
EE	Estonia	**LR**	Liberia	**SG**	Singapore		

Steriliser

Technical Field

The present invention is in the field of sterilisation apparatus for sanitising or disinfecting a substance.

Background to the Invention

It is known to use ultraviolet (UV) radiation in sterilisation systems for use in the purification of water and the sanitisation of items. The UV radiation and any ozone produced by the UV radiation with oxygen in the air acts to kill bacteria and germs. It is also known to employ microwave energy to excite the source of UV radiation in such systems.

One problem with known systems is that it is difficult to safely provide sufficient excitation energy to the UV source and difficult to effectively transfer that energy to the substance to be sterilised. It is therefore difficult to arrange systems for high energy, high throughput sterilisation purposes.

There is now described a steriliser which enables efficient, high throughput sterilisation to be conducted. The steriliser comprises a UV lamp which is excited by a microwave energy source. The lamp is enclosed by a waveguide comprising UV transparent material.

WO96/40298 describes an electrodeless sterilisation apparatus comprising a UV lamp which is excited by a microwave energy source. The UV lamp is shaped to define a sterilisation passage therein. In use, the substance to be sterilised is passed through the sterilisation passage in the lamp. It may be appreciated that the size and geometry of the sterilisation passage will inevitably place limitations on the types of substances which may be sterilised using this apparatus and on the throughput achievable. It is also believed that direct contact of water with the lamp may affect the sterilisation capability of the lamp. Further, from a safety standpoint it is clearly undesirable that any breakage of the lamp may result in toxic vapour elements (e.g. mercury) contacting the substance to be sterilised.

US-A-5,166,528 describes a microwave excited ultraviolet steriliser for surface sterilisation of articles such as baby bottles and contact lenses. The steriliser comprises a plurality of UV bulbs which directly emit radiation to the articles.

US-A-5,141,636 describes a water purification system in which water is flowed along a flow path past a UV source. No mention is made of microwave excitation of the UV source.

WO97/35624 describes a steriliser employing a microwave-actuated UV energy source as the sterilisation means. No waveguide is provided between the UV energy source and the substance to be sterilised.

Summary of the Invention

According to one aspect of the present invention there is provided a steriliser comprising an ultraviolet lamp; a microwave energy source for exciting said ultraviolet lamp; and an enclosure for enclosing the ultraviolet lamp, the enclosure comprising a UV transparent waveguide.

By steriliser it is meant an apparatus suitable for use in any sterilisation, sanitisation, purification or disinfection processes.

By UV transparent waveguide it is meant a waveguide that is substantially transparent to ultraviolet radiation, typically having a transparency of greater than 90%, preferably greater than 95% to UV radiation.

Suitably, the ultraviolet lamp has no electrode. That is to say it is an electrode-less lamp such as one comprising a partially evacuated tube comprising an element or mixtures of elements in vapour form. Mercury is a preferred element for this purpose, but alternatives include mixtures of inert gases with mercury compounds, sodium and sulphur. Preferably, the dominant wavelength produced by the lamp is 254nm.

In one aspect, the waveguide controls the flow of microwave energy from the enclosure. Control of the microwave energy which passes through the waveguide is useful in embodiments of the invention which make of both UV and microwave radiation in the sterilisation process.

In another aspect, the waveguide blocks the flow of microwave energy from the enclosure.

Suitably, the enclosure comprises quartz or a UV-transparent plastic material.

Suitably, the waveguide comprises a conducting material. The conducting material may be integral, or applied as a coating or liner. The liner may directly contact the inner surface of the enclosure or be spaced therefrom.

Suitably, the waveguide comprises a conducting mesh. Preferably, the conducting mesh comprises a material selected from the group consisting of copper, aluminium and stainless steel.

Suitably, the ultraviolet lamp has an elongate form such as a cigar-shape.

Suitably, the transparent waveguide has a cylindrical or rectangular form.

Suitably, the ultraviolet lamp has an operating temperature of less than 70°C.

Suitably, the microwave energy source comprises a magnetron. Alternative sources are envisaged such as solid state devices.

Suitably, the steriliser additionally comprises a pathguide to guide the microwave energy from the microwave energy source to the ultraviolet lamp.

In one aspect the pathguide defines an essentially linear path for the microwave energy.

In another aspect, the pathguide defines a non-linear path such as a path defining at least one right angle.

Suitably, the steriliser additionally comprises a housing for said enclosure. Preferably, the housing has an inlet and an outlet and the housing is shaped to guide fluid flow from the inlet, past the enclosure to the outlet. Preferably, the fluid comprises water or air. Suitably, the steriliser additionally comprises a pump for pumping fluid from the inlet, past the enclosure to the outlet. Alternatively, gravity may be utilised to encourage fluid flow.

According to another aspect of the present invention there is provided a lamp arrangement for use in a steriliser comprising an ultraviolet lamp, said lamp being excitable by microwave energy; and an enclosure for enclosing the ultraviolet lamp, the enclosure comprising a UV transparent waveguide.

Preferably, the ultraviolet lamp has no electrode.

According to a further aspect of the present invention there is provided a method of sterilising a substance comprising applying microwave energy to an ultraviolet lamp to produce ultraviolet radiation; and exposing the substance to said ultraviolet radiation, wherein an enclosure encloses the ultraviolet lamp, the enclosure comprising a UV transparent waveguide.

In one aspect, the substance flows past the enclosure.

Brief description of the drawings

Preferred embodiments of the steriliser in accord with the present invention will now be described with reference to the accompanying drawings in which:

Figure 1. is a schematic representation of a first steriliser herein suitable for water purification purposes;

Figures 2a and 2b are schematic representations of second and third sterilisers herein suitable for use in water purification;

Figures 3a and 3b are schematic representations of fourth and fifth sterilisers herein suitable for use in air purification;

Figure 4. is a schematic representation of a sixth steriliser herein suitable for use in combined UV and microwave sterilisation methods.

Detailed description of the invention

The present invention is here described by means of examples, which constitute possible embodiments of the invention.

Figure 1. shows a steriliser comprising an ultraviolet lamp 10 enclosed by cylindrical enclosure 20. The cylindrical walls of the enclosure 20 form a waveguide and are comprised of quartz material which is transparent to UV radiation. A conducting copper mesh 30 is provided to the inner surface of the waveguide. First end of the cylindrical enclosure has blocking end flange 22 provided thereto. The second end is provided with coupling flange 24 which couples with right angled waveguide 40 which in turn connects with rectangular waveguide 50. Magnetron 60 acts as a microwave energy source to feed microwaves into the rectangular waveguide 50, thence into the right angled waveguide 40 and finally to the ultraviolet lamp 10 which is excited thereby.

The enclosure 20 is within tubular housing 70. The housing 70 has a water inlet 72 and a water outlet 74 provided thereto. In use, water flows from the inlet 72 past the enclosure 20 and towards the outlet 74. As the water flows past the enclosure 20 it is irradiated with UV radiation produced by the ultraviolet lamp 10. The radiation itself passes through the UV transparent walls of the enclosure 120a, 120b to contact the water.

Figures 2a and 2b show related santisers herein. Both comprise ultraviolet mercury discharge lamp 110a, 110b enclosed by cylindrical enclosure 120a, 120b. The cylindrical walls of the enclosure 120a, 120b form a waveguide and are comprised of quartz material which is transparent to UV radiation. A conducting copper mesh 130a, 130b is provided to the inner surface of the waveguide. The enclosure 120a, 120b has air or nitrogen circulating therein. First end of the cylindrical enclosure has blocking end flange 122a, 122b provided thereto. The second end is provided with coupling flange 124a, 124b which couples with water-tight chamber 150a, 150b which contains brass waveguide 140a, 140b and magnetron 160a, 160b. The magnetron 160a, 160b acts as a microwave energy source to feed microwaves into the brass waveguide 140a, 140b and thence to the ultraviolet lamp 110a, 110b which is excited thereby.

The enclosure 120a, 120b is within tubular housing 170a, 170b. The housing 170a, 170b has a water inlet 172a, 172b and a water outlet 174a, 174b provided thereto. In use, water flows from the inlet 172a, 172b past the enclosure 120a, 120b and towards the outlet 174a, 174b. As the water flows past the enclosure 120a, 120b it is irradiated with UV radiation produced by the ultraviolet lamp 110a, 110b. The radiation itself passes through the UV transparent walls of the enclosure 120a, 120b to contact the water.

Figures 3a and 3b show sanitisers similar in structure to the sanitisers of Figures 2a and 2b but for use in air purification. Both comprise ultraviolet mercury discharge lamp 210a, 210b enclosed by cylindrical enclosure 220a, 220b. The cylindrical walls of the enclosure 220a, 220b form a waveguide and are comprised of quartz material which is transparent to UV radiation. A conducting copper mesh 230a, 230b is provided to the inner surface of the waveguide. The enclosure 220a, 220b has air or nitrogen circulating therein. First end of the cylindrical enclosure has blocking end flange 222a, 222b provided thereto. The second end is provided with coupling flange 224a, 224b which couples with air-tight chamber 250a, 250b containing brass waveguide 240a, 240b and magnetron 260a, 260b. The magnetron 260a, 260b acts as a microwave energy source to feed microwaves into brass waveguide 240a, 240b and thence to the ultraviolet lamp 210a, 210b which is excited thereby.

The enclosure 220a, 220b is within tubular housing 270a, 270b. The housing 270a, 270b has an air inlet 272a, 272b and an air outlet 274a, 274b provided thereto. In use, air flows from the inlet 272a, 272b past the enclosure 220a, 220b and towards the outlet 274a, 274b. As the air flows past the enclosure 220a, 220b it is irradiated with UV radiation produced by the ultraviolet lamp 210a, 210b. The radiation itself passes through the UV transparent walls of the enclosure 220a, 220b to contact the air killing the bacteria and germs therein.

Figure 4 shows a cabinet steriliser herein suitable for use in sterilising objects such as medical instruments. Ultraviolet mercury discharge lamp 310 is enclosed by cylindrical enclosure 320. The cylindrical walls of the enclosure 320 form a waveguide and are comprised of quartz material which is transparent to UV radiation but only partially transparent to microwave radiation. A conducting copper mesh 330 is provided to the inner surface of the waveguide. The enclosure 320 optionally has air or nitrogen circulating therein. First end of the cylindrical enclosure has blocking end flange 322 provided thereto. The second end is provided with coupling flange 324 which couples with linear pathguide 340 which in turn connects with magnetron 360. The magnetron 360 acts as a microwave energy source to feed microwaves into pathguide 340 and thence to the ultraviolet lamp 310 which is excited thereby.

The enclosure 320 is within housing 370 which has an entry door 380 provided thereto. In use, items to be sterilised, which can include metal items, are placed in the housing 370. The items are irradiated with UV radiation produced by the ultraviolet lamp 310 and by microwave radiation deriving from the magnetron

360. The radiation itself, passes through the UV transparent and microwave partially transparent walls of the enclosure 320 to contact the items. Optionally, the housing 370 may be provided with UV transparent shelves for the items. An inner reflective lining, for example an aluminium foil lining, may also be provided to the housing 370.

The steriliser of the present invention is suitable for use in sterilising water for human consumption; sterilising waste water and sewage; sterilising metallic and non-metallic objects including medical instruments; sterilising air in buildings such as hospitals, offices and homes; curing glues and special inks; erasing eproms; and prolonging the shelf-life of foodstuffs by killing bacteria on the surface of the goods.

The steriliser of the present invention is suitable in one aspect for use in air-conditioning systems for use in vehicles such as cars, lorries and buses. The sanitiser will be sized and shaped to fit within the air-conditioning system of the vehicle and will typically therefore have a size less than the size it would possess when used in large scale air and water treatment applications.

The ultraviolet light produced by the sanitiser herein may additionally be channelled as a light source of high intensity. Suitable uses would include lighting within buildings and lighting for vehicles such as cars, lorries and buses.

Claims

1. A steriliser comprising

an ultraviolet lamp;

a microwave energy source for exciting said ultraviolet lamp; and

an enclosure for enclosing the ultraviolet lamp, the enclosure comprising a UV transparent waveguide.

2. A steriliser according to claim 1, wherein the ultraviolet lamp has no electrode.

3. A steriliser according to either of claims 1 or 2, wherein the waveguide controls the flow of microwave energy from the enclosure.

4. A steriliser according to either of claims 1 or 2, wherein the waveguide blocks the flow of microwave energy from the enclosure.

5. A steriliser according to any of claims 1 to 4, wherein the enclosure comprises quartz or a UV-transparent plastic material.

6. A steriliser according to any of claims 1 to 5, wherein the waveguide comprises a conducting material.

7. A steriliser according to claim 6, wherein the waveguide comprises a conducting mesh.

8. A steriliser according to claim 7, wherein the conducting mesh comprises a material selected from the group consisting of copper, aluminium and stainless steel.

9. A steriliser according to any of claims 1 to 8, wherein the ultraviolet lamp has an elongate form.

10. A steriliser according to any of claims 1 to 9, wherein the transparent waveguide has a cylindrical or rectangular form.

11. A steriliser according to any of claims 1 to 10, wherein the ultraviolet lamp has an operating temperature of less than 70°C.

12. A steriliser according to any of claims 1 to 11, wherein the microwave energy source comprises a magnetron.

13. A steriliser according to any of claims 1 to 12, additionally comprising a pathguide to guide the microwave energy from the microwave energy source to the ultraviolet lamp.

14. A steriliser according to claim 13, wherein the pathguide defines an essentially linear path.

15. A steriliser according to claim 13, wherein the pathguide defines a non-linear path.

16. A steriliser according to any of claims 1 to 15 additionally comprising a housing for said enclosure.

17. A steriliser according to claim 16, wherein the housing has an inlet and an outlet and the housing is shaped to guide fluid flow from the inlet, past the enclosure to the outlet.

18. A steriliser according to claim 17, wherein said fluid comprises water or air.

19. A steriliser according to either of claims 17 to 18, additionally comprising a pump for pumping fluid from the inlet, past the enclosure to the outlet.

20. A steriliser substantially as described in the accompanying description and drawings

21. A lamp arrangement for use in a steriliser comprising

an ultraviolet lamp, said lamp being excitable by microwave energy; and

an enclosure for enclosing the ultraviolet lamp, the enclosure comprising a UV transparent waveguide.

22. A lamp arrangement according to claim 21, wherein the ultraviolet lamp has no electrode.

23. A lamp arrangement substantially as described in the accompanying description and drawings

24. A method of sterilising a substance comprising

applying microwave energy to an ultraviolet lamp to produce ultraviolet radiation; and

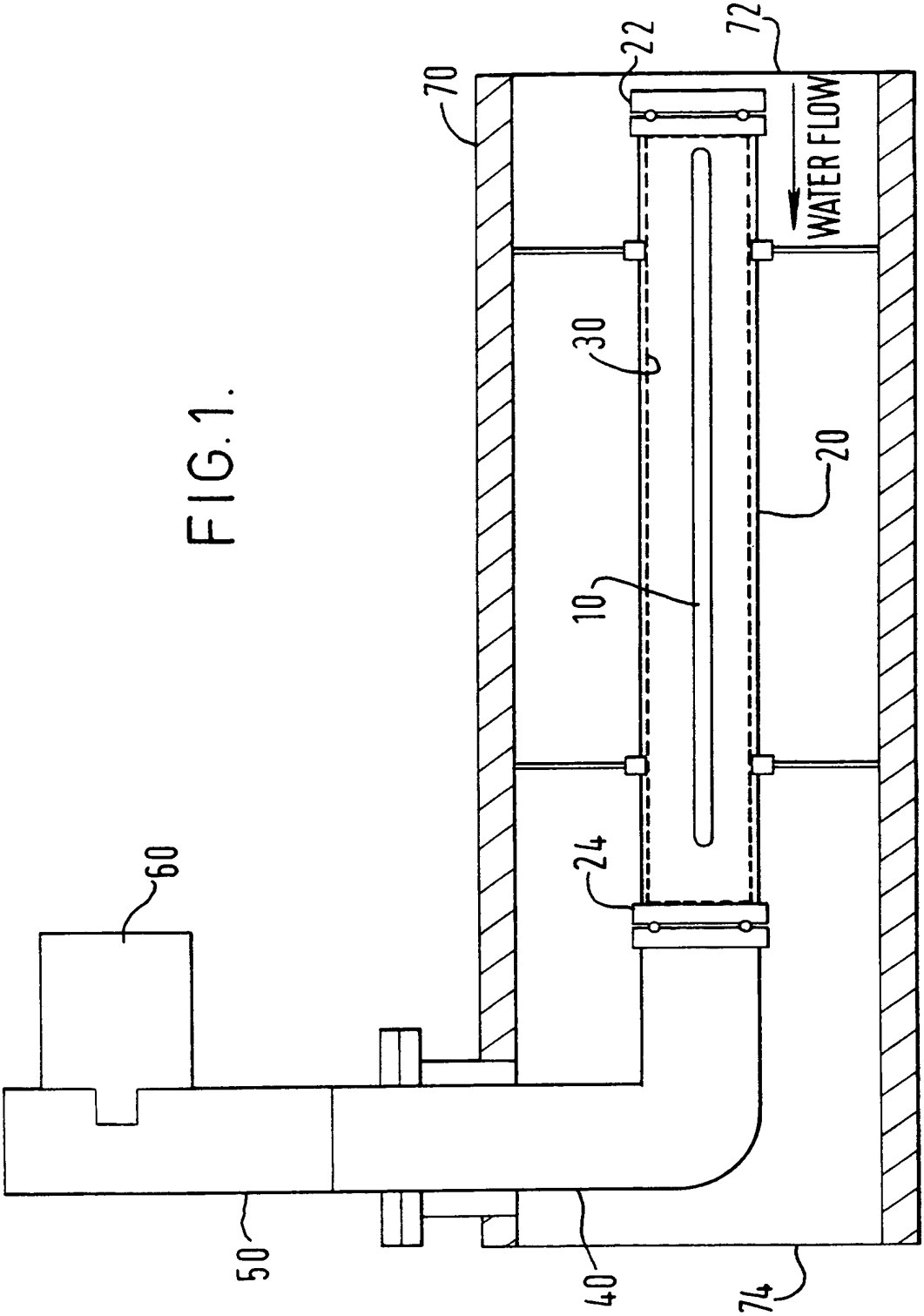
exposing the substance to said ultraviolet radiation, wherein

an enclosure encloses the ultraviolet lamp, the enclosure comprising a UV transparent waveguide.

25. A method according to claim 24, wherein the substance flows past said enclosure.

26. A method of sterilising a substance substantially as described in the accompanying description and drawings.

FIG. 1.



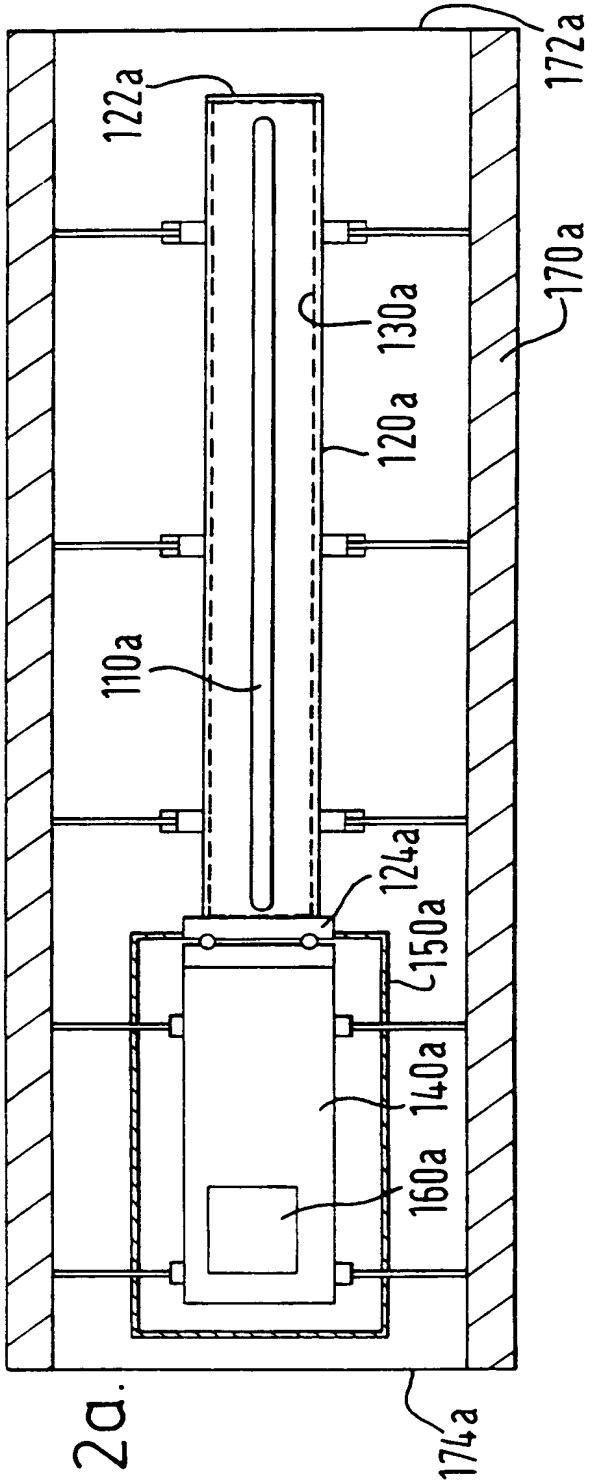

172a
122a
170a
130a
120a
110a
124a
150a
140a
160a
174a

FIG. 2a.

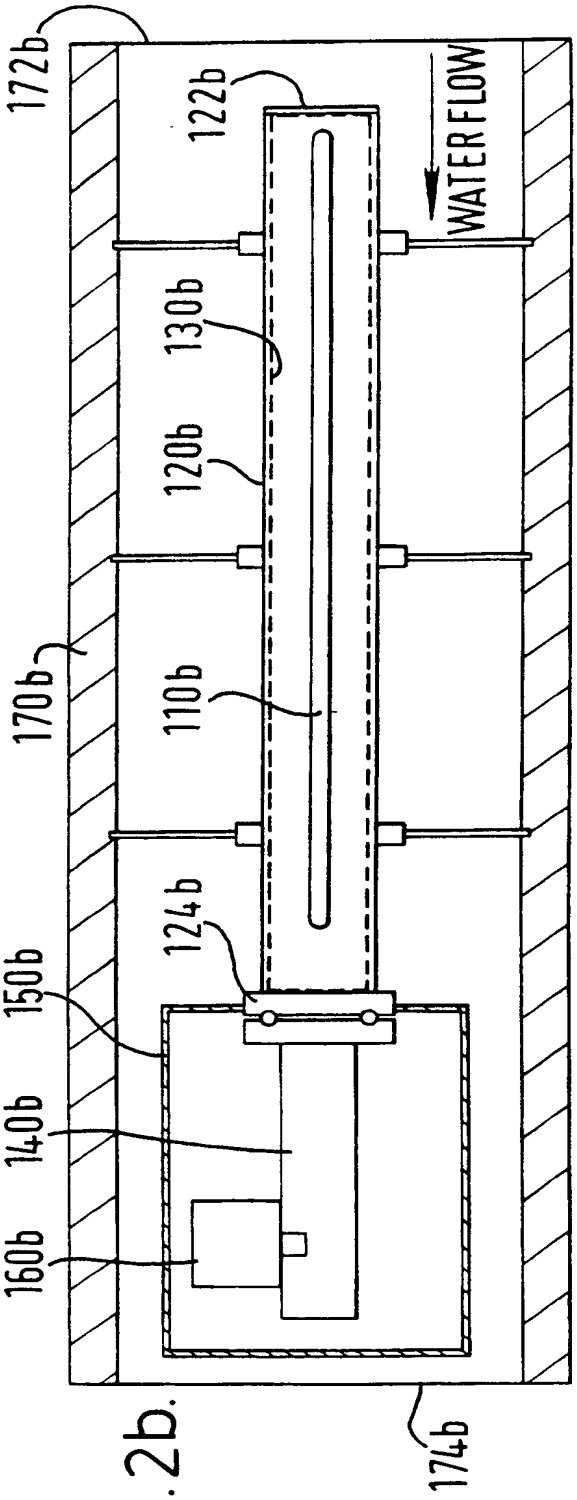

172b
122b
WATER FLOW
130b
120b
170b
110b
124b
150b
140b
160b
174b

FIG. 2b.

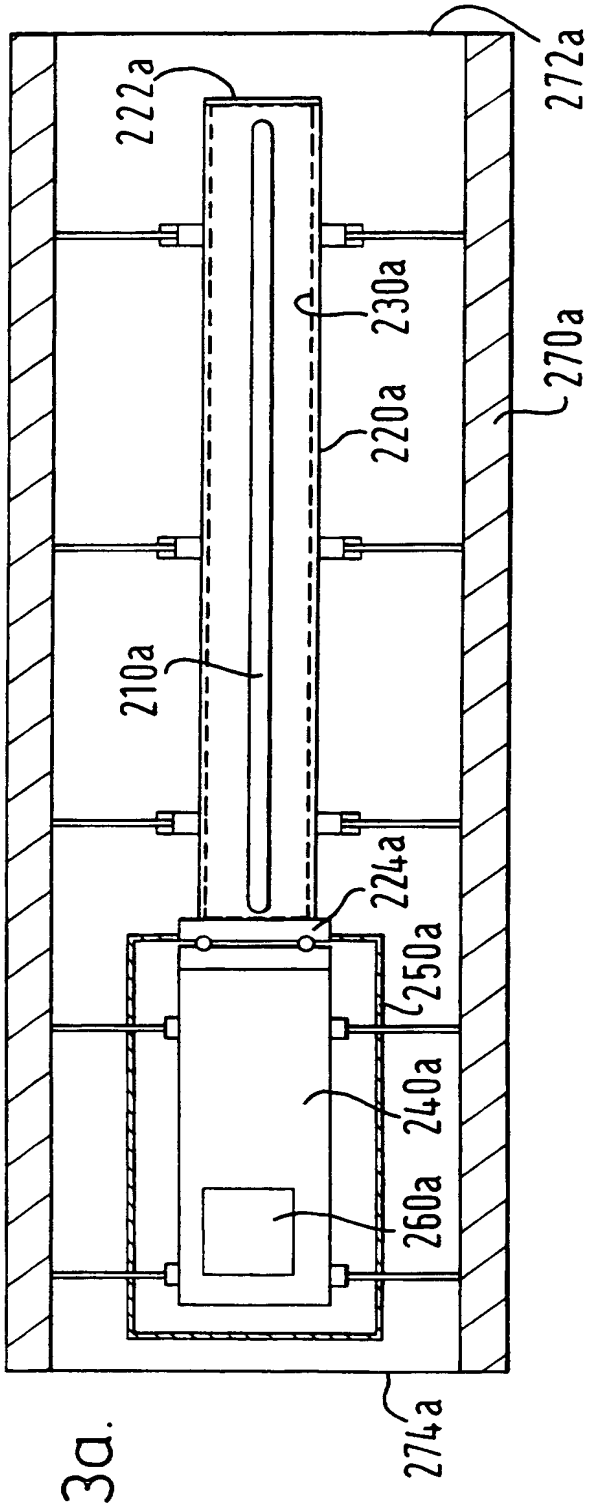

222a
272a
230a
270a
220a
210a
224a
250a
240a
260a
274a

FIG. 3a.

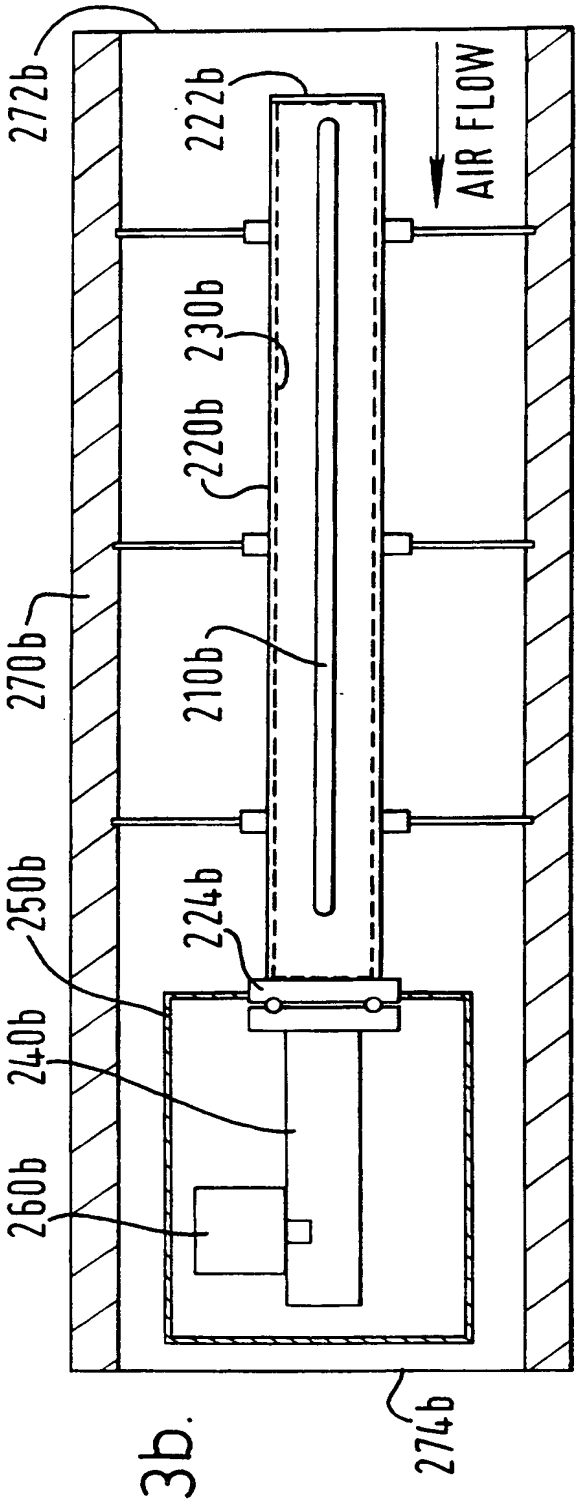

272b
222b
AIR FLOW
230b
220b
270b
210b
250b
224b
240b
260b
274b

FIG. 3b.

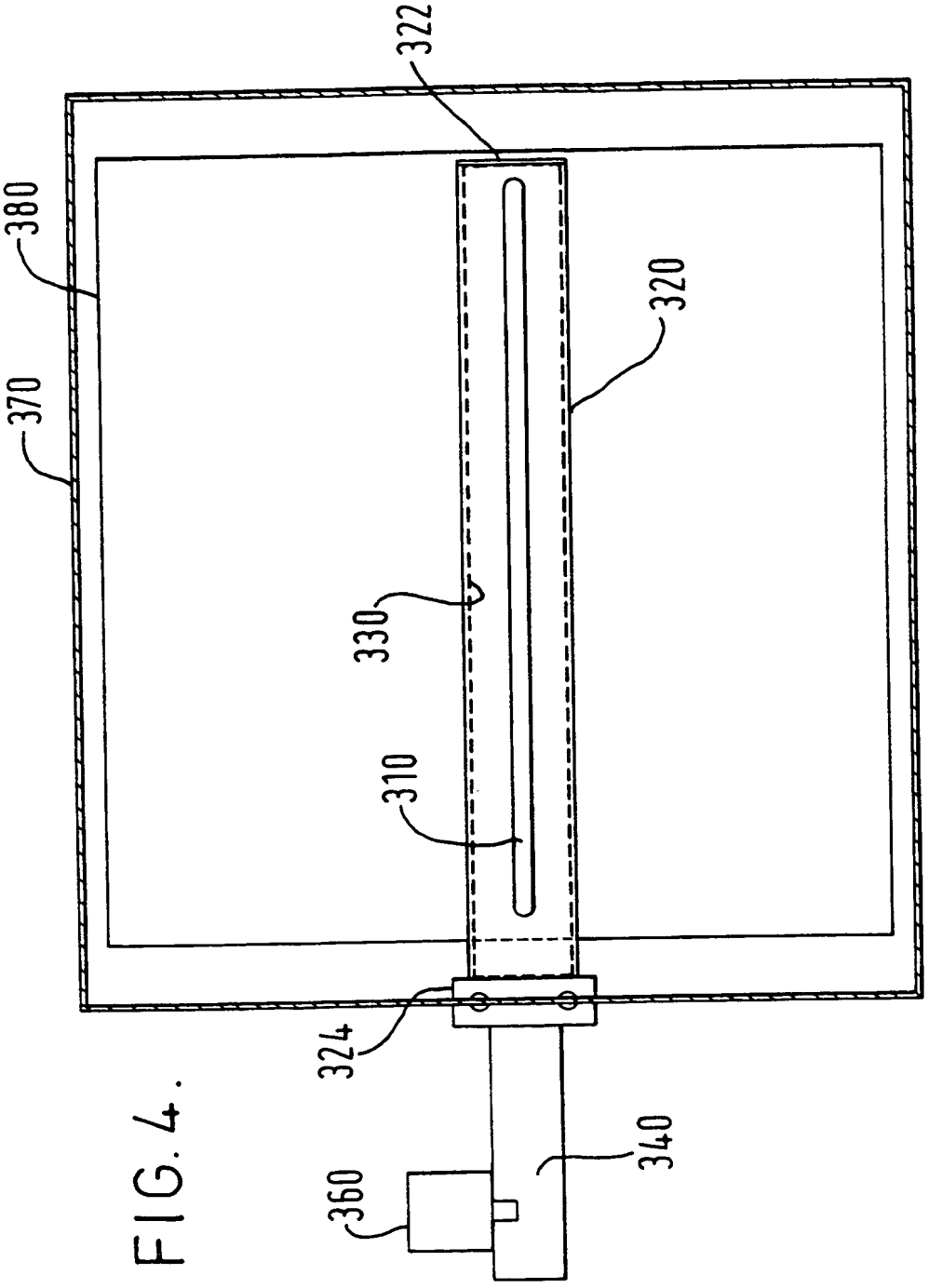


FIG. 4.